Advanced GIS & Spatial Analysis

Geography 4211 – Winter 2018

Course Description:

This is an advanced course in the applications of geographic information systems and spatial analysis. The course will be delivered through a combination of lectures, seminar discussions, student presentations and laboratory work (see Schedule). Students will continue to develop their working expertise of ArcGIS along with other software packages.

Learning Outcomes:

In completing the course students will build on their introductory geomatics training, developing an appreciation for more advanced forms of spatial analysis such as interpolation, network analysis, and various forms of modelling. Planning and executing a complex project will require students to develop an appreciation toward the acquisition of spatial datasets, their accuracies and properties, as well as the complexities of database development, error management, and overall project execution. Students will also explore, and thus be able to evaluate, different media for publishing or disseminating the results of such investigations.

Instructors:

The course in Winter 2018 will be jointly delivered by a team of instructors. The specific content and sequencing of the sessions has been developed to take advantage of the varied expertise amongst the instructional team. For consultation outside of designated class times, students should approach the respective instructor to which the specific coursework pertains; otherwise inquiries of a general or logistical nature should be directed to the Chair of Geography who will also act as the lead coordinator**.

Instructor	**Office**	**email**
Dr. Rob Stewart**	RC-2006E	rob.stewart@lakeheadu.ca
Dr. Adam Cornwell	RC-2006D	adam.cornwell@lakeheadu.ca
Mr. Jason Freeburn	RC-2004	jason.freeburn@lakeheadu.ca
Mr. Reg Nelson	RC-2001	rjnelson@lakeheadu.ca
Dr. Brad Wilson	RC-2006A	brad.wilson@lakeheadu.ca
Dr. Will Wilson	RC-2006C	will@aspencroft.ca
Dr. Kamil Zaniewski	RC-2006F	kamil.zaniewski@lakeheadu.ca

Office Hours: as posted on each Instructor's door.

Grading:

Laboratory Assignments:		15%
ArcGIS Modules:		15%
Group Project:		50%
Participation/Progress reporting	5%	
Initial planning report	5%	
Proposal presentation	5%	
Report and Database	10%	
Online Product	10%	
Poster	10%	
Final presentation	5%	
Final Exam:		20%
	TOTAL:	**100%**

Meeting Times:

Lectures: Wednesday and Friday
11:30am – 12:30p.m.
RC-2003

Laboratory: Monday
2:30 – 4:30p.m.
ATAC-3009

Required Materials:

Text: Chang, K., 2016. *Introduction to Geographic Information Systems*, 8th Edition (New York, NY: McGraw-Hill), 448 pages [ISBN 978-0-07-809513-9]

> ***Note:*** *An earlier version of this text is fine for the course. In some cases (for example, the Modules) there may be reference to specific questions or content from the text which happens to fall on a different page in previous versions. Where known, these differences will be made clear.*

Storage Device/Drive: Each student will be required to have a secure method for long-term storage of spatial (and other) files. The laboratory computers in ATAC-3009 (as with all university laboratory hardware), do not allow for storage on the hard drive. It is therefore recommended that you use a drive share (for example, Google Drive can be accessed through your Lakehead Gmail account), your personal drive on the Active Directory, and/or portable USB memory device for digital storage.

ArcGIS Modules:

The modules are based on defined exercises found at the end of each chapter in the course text. They are designed for students to follow a relatively straightforward workflow, produce results and thus illustrate the power of various software tools. They can be completed in an hour or two.

Lab Exercises:

The lab exercises are more complex than the modules and are designed such that students will need to integrate various tools and datasets to achieve the desired results. Unlike lab exercises in lower-year geomatics courses, here the initial data layers will be provided and the specific target results will be outlined. The necessary workflow to achieve those results is the responsibility of the student to consider, implement and evaluate. The expectation is these exercises (both the analysis and resulting maps, statistics, and answers to specific questions) will take 5-10 hours to complete.

Group Projects:

Working in small groups, students will plan and execute a complex project, expected to integrate a suite of spatial data through a series of spatial analyses to solve a current-day problem. A specific outline of expectations for the projects will be discussed the first week of classes, along with the formation of groups and a brief review of example projects completed in Winter 2016/17. Based on the problem of interest and the expected analyses, groups will work with assigned instructors to develop an appropriate database, analysis workflow and final products. Project topics and a 'rough plan' must be finalized prior to the Project Progress Reports the week of January 29th. A report and presentation on the result of data scoping, database development, and the planned analysis workflow will be provided at the end of February (the week after Reading Week). A 2nd presentation of final results will be provided the final two weeks of the term (refer to the attached schedule). A final report discussing the success of the project and detailing any issues encountered and the limitations associated with the use of the final products is due at the end of March.

We hope you enjoy the course!!

Course Schedule: (subject to changes)

Week of:	Monday Lab 2:30 - 4:30, ATAC-3009	Wednesday Lecture 11:30-12:30, RC-2003	Friday Lecture 11:30-12:30, RC-2003	Reading Requirements[1] / Due Dates
Jan. 8	No Lab – Course begins Wed. Jan. 10th →	Intro. - Course Syllabus, Term Projects	Spatial Project Mgmt *(W. Wilson)*	
Jan. 15	Module #1[2] - Data Management & Display	Terrain Analysis *(K. Zaniewski)*	Watershed Analysis *(R. Stewart)*	Chang: Ch. 13, Ch. 14; ***Module #1 due Jan. 22***
Jan. 22	Module #2 - Terrain Mapping & Watershed Analysis	Site Selection & Index Models *(K. Zaniewski)*	Database Development, Data Quality & Error Mgmt (*B. Wilson*)	Chang: Ch. 18; ***Module #2 due Jan. 29***
Jan. 29	Lab#1 - Raster Process Models	Term Project Progress Reports[3]	Raster Local & Neighbourhood Operations *(J. Freeburn)*	Chang: Ch. 11
Feb. 2	Lab#1 - Raster Process Models (cont'd)	Spatial Interpolation Techniques *(J. Freeburn)*	Network Analysis *(R. Nelson)*	Chang: Ch. 15, Ch. 17; ***Lab #1 due Feb. 12***
Feb. 12	Module #3 - Spatial Interpolation	Network Applications *(R. Nelson)*	Spatial Statistics *(TBD)*	***Module #3 due Feb. 16***
Feb. 26	Module #4 - Network Applications	Presentations - Group Project Plan[3]	Presentations - Group Project Plan[3]	***Initial (Group) Planning Report due Feb. 28;***
Mar. 5	Module #5 – Spatial Statistics	GIS Applications in Climatology *(A. Cornwell)*	Group Project Work Period	***Module #4 due Mar. 5***
Mar. 12	Lab #2 - Modelling Spatial Relationships	Group Project Work Period	Group Project Work Period	***Module #5 due Mar. 14***
Mar. 19	Group Project Work Period	Group Project Seminar - Updates & Questions[4]	Group Project Work Period	***Lab #2 due Mar. 19***
Mar. 26	Group Project Work Period	Group Project Seminar - Updates & Questions	Final Project Presentations[3]	***Final Project Report, Online Product and Poster due Mar. 30***
Apr. 2	No Lab	Final Project Presentations[3]	Final Project Presentations[3]	

Notes: [1]Readings should be completed PRIOR to the week listed. [2]Module work and lab work will be coordinated by J. Freeburn. Once completed, modules should be sent via email to jason.freeburn@lakeheadu.ca. Deliverables for lab exercises will be outlined for each lab respectively. [3]Group presentations will be jointly evaluated by (available) course instructors. Group project reports will be evaluated by J. Freeburn and can be submitted digitally via email. [4](Available) course instructors will be on-hand to answer questions and facilitate group discussion. The Final Examination period is scheduled for April 13-25; there is no flexibility in the scheduling of final exams.